Scholarship Paper

Subject:
Paper:
Time: 45 Minutes

You must have:
Pen
Pencil

Total Marks
45

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - *There may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 45
- Each multiple choice question is a mark
- The marks for **each** question are shown in brackets
  - *Use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions.

Q1.

(a) The diagram shows some electrical circuit symbols.

A

B

C
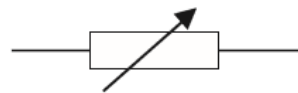
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(i) Which symbol represents a switch? **(1)**

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Which symbol represents a diode? **(1)**

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) All metals are good conductors of electricity.
Which of these non-metals can conduct electricity? **(1)**

☒ **A** carbon

☒ **B** chalk

☒ **C** plastic

☒ **D** rubber

(b) Resistors can be used as heating elements in the rear windows of cars. The diagram shows two possible designs.

X

Y

(i) Complete the table by placing a tick in the correct boxes. **(1)**

Design	Series	Parallel
X		
Y		

(ii) Describe the advantages and disadvantages of design X when used as a heater in a car window.

(3)

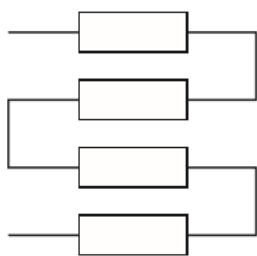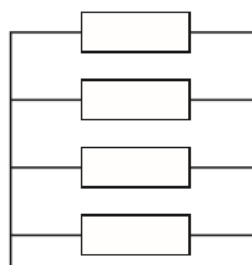..

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(Total for Question 1 = 7 marks)

Q2.
A student measures the density of water.
She uses a measuring cylinder and an electronic balance.

(a) State the equation linking density, mass and volume. **(1)**

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(b) A correct unit for density is **(1)**

☒ **A** g/cm

☒ **B** kg/cm

☒ **C** g/cm²

☒ **D** g/cm³

(c) Complete the table to show what is measured by an electronic balance. **(1)**

Measuring instrument	What it measures
measuring cylinder	volume
electronic balance	

(d) Describe how the student should use each instrument to make her measurements as accurate as possible.
(4)

Measuring cylinder

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Electronic balance

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(e) The student wants to make sure her experiment is a fair test.

(i) State one factor that she should keep the same throughout her experiment. **(1)**

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(ii) Why is it important that she keeps this factor constant? **(1)**

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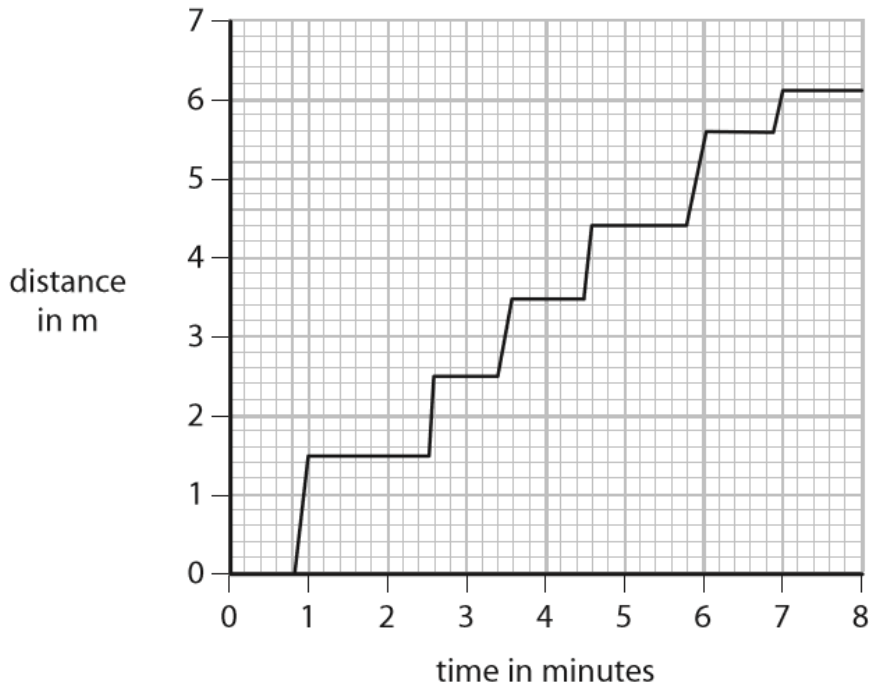
(Total for Question 2 = 9 marks)

Q3.

The diagram shows some people waiting in a queue at a supermarket.

The queue moves forward each time a person leaves the checkout. Person X spends seven minutes in the queue before reaching the checkout. The graph shows how distance changes with time for person X.

(a) (i) What is the initial length of the queue? **(1)**

initial length = ... m

(ii) Explain how you could use the graph to work out the number of times person X is stationary.

(2)

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(b) (i) State the equation linking average speed, distance moved and time taken. **(1)**

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(ii) Calculate the average speed of person X in the queue.   Give the unit. **(3)**

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average speed = ... unit ....
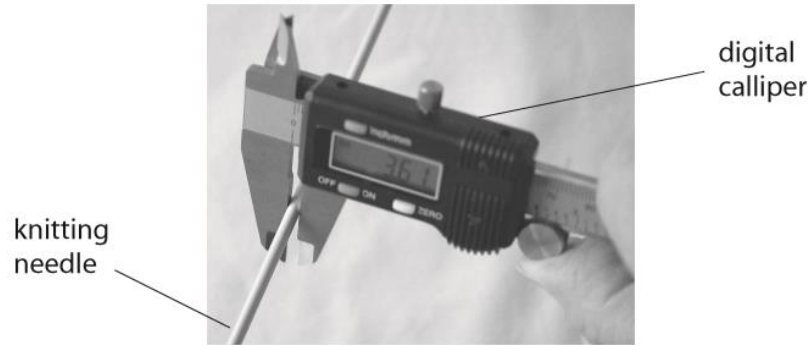
(Total for Question 3 = 7 marks)

Q4.

A student uses a digital calliper to measure the diameter of a knitting needle.

The digital calliper gives readings to the nearest 0.01 mm.

(a) The student measures the diameter of the knitting needle eight times. These are her readings.

(i) Circle the anomalous reading. **(1)**

(ii) Calculate the average value for the diameter of the knitting needle. **(3)**
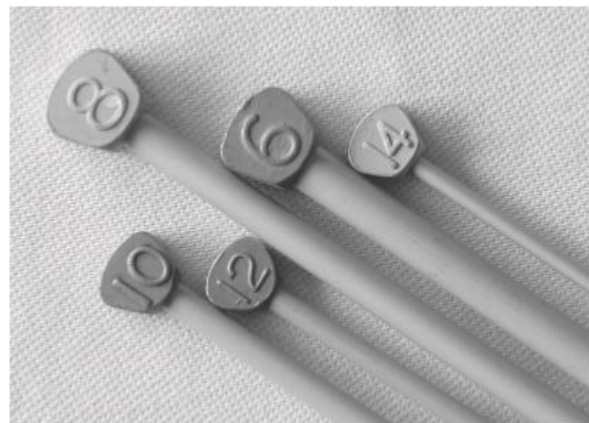
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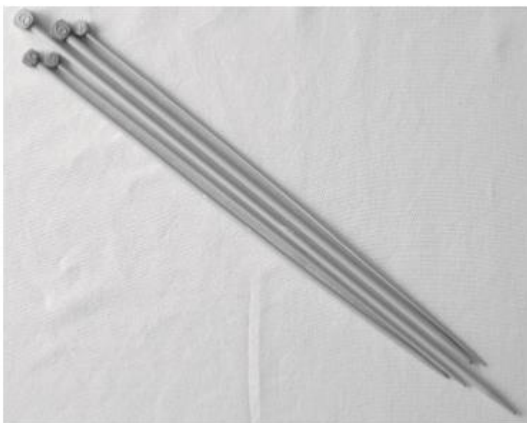
average diameter = ... mm
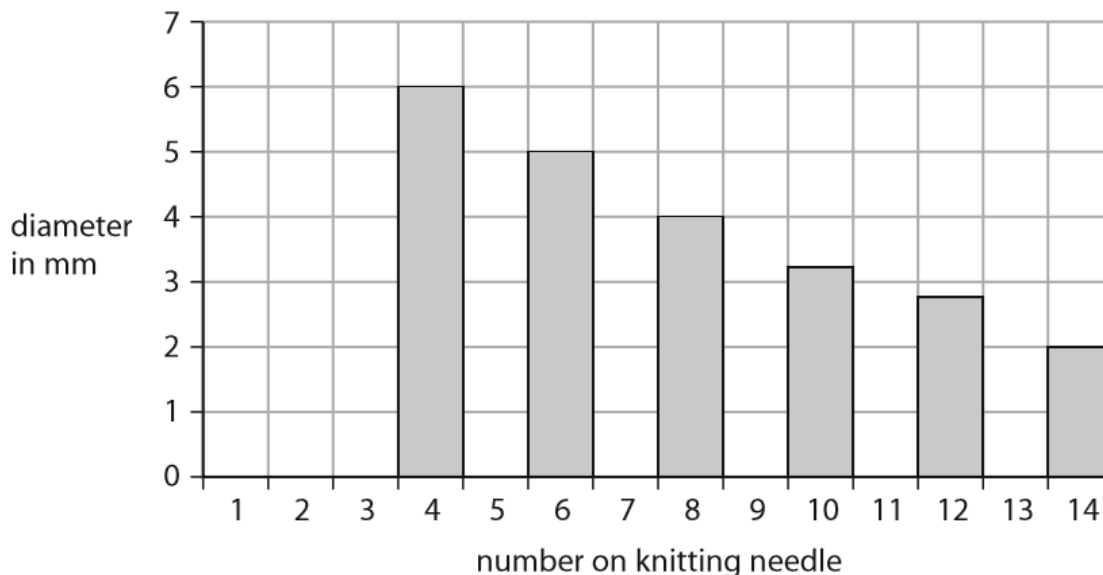
(b) The student finds more knitting needles, some of which are shown in the photographs.

Each knitting needle is marked with a number that indicates its size.
Each number corresponds to a set diameter, as shown in the table.

Number on knitting needle	Diameter in mm
14	2.00
12	2.75
10	3.25
8	4.00
6	5.00
4	6.00

The student displays this data as a chart.

(i) Name the type of chart used by the student. **(1)**

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(ii) Explain why the data is best displayed using this chart rather than another type of graph **(2)**

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(iii) Describe the relationship between the number on a knitting needle and its diameter. **(2)**

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(c) The knitting needles are not uniform in shape. Describe how the student could measure the volume of a non-uniform shape. **(4)**

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(Total for Question 4 = 13 marks)

Q5.

The volume of a piece of brass is 16.3 cm³. A student measures its mass using an electronic balance. The mass of the brass is 138 g.

(a) Calculate the density of brass. **(3)**

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.   density = ...

(b) The student notices that the electronic balance has a zero error, so it shows mass readings that are all slightly too small. This means that the density value is **(1)**

☒ **A** incorrect and slightly too large

☒ **B** incorrect and slightly too small

☒ **C** correct because the student used three significant figures

☒ **D** correct because the mass of the block is more than zero

(Total for Question 5 = 4 marks)

Q6.

(a) (i) Which list gives the astronomical objects in order of size, starting with the largest? **(1)**

☒ **A** galaxy – Solar System – planet – Sun

☒ **B** galaxy – Solar System – Sun – planet

☒ **C** planet – galaxy – Solar System – Sun

☒ **D** planet – Solar System – Sun – galaxy

(ii) The diagram shows four planets, P, Q, R and S, orbiting a star.
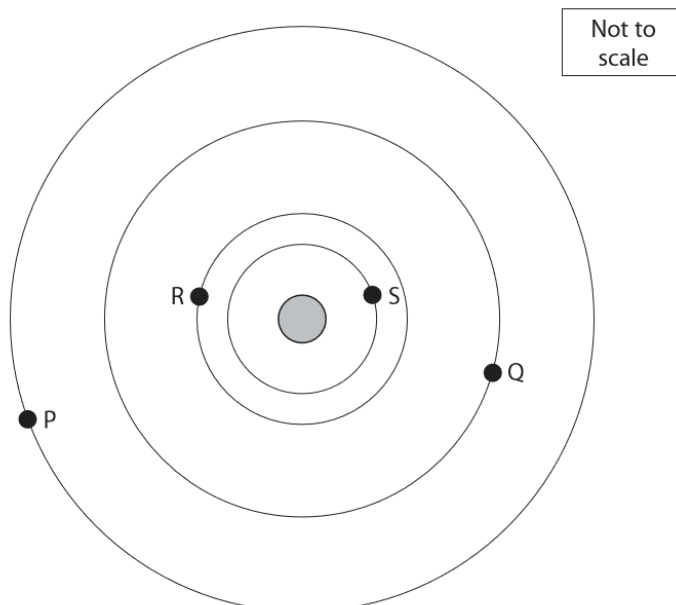
This combination of planets and a star is most like. **(1)**

⊠ **A** a galaxy

⊠ **B** the Milky Way

⊠ **C** the Solar System

⊠ **D** the universe

(b) The Earth and Mars are planets in our Solar System.

(i) State two ways in which the orbits of Earth and Mars are similar. **(2)**

1

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2

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(ii) State one ways in which the orbits of Earth and Mars are different. **(1)**

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(Total for Question 6 = 5 marks)

TOTAL FOR THE PAPER = 45 MARKS